United States Court of Appeals

for the Second Circuit

APPELLANT'S BRIEF

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UNITED STATES COURT OF APPEALS
SECOND CIRCUIT

JOSEPH ANTHONY CAMIRE, Infant, by his Father, JAMES ANTHONY CAMIRE, and his Mother, GAIL MARIE CAMIRE, and JAMES ANTHONY CAMIRE and GAIL MARIE CAMIRE, Individually,

Plaintiffs-Appellants,

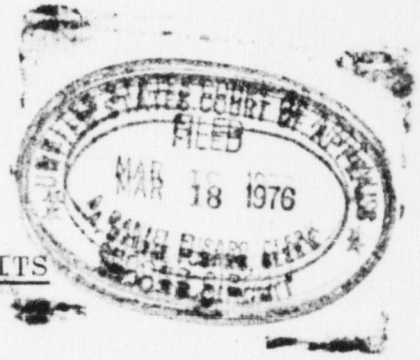
-against-

UNITED STATES OF AMERICA,

Defendant-Respondent.

P/S

Docket No.
76 CIV 6038



APPELLANTS' BRIEF AND EXHIBITS

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PRELIMINARY STATEMENT

This is a medical malpractice action commenced under the Federal Tort Claim Act. The action was commenced against the United States of America and Capt. Donald Marger, M.D. The defendants, by the U.S. Attorney, made two motions to dismiss the action against them. The motion against defendant, Marger, was based upon the grounds that defendant, Marger, was an agent, servant and employee of the defendant, United States of America, at the time of the malpractice and was not liable for his acts of malpractice while performing his duties as an employee of defendant, United States of America. This motion was granted upon consent. The second motion was made pursuant to Rule 12 (b)(6) of the Federal Rules of Civil Procedure which was treated as a motion for summary judgment under Rule 56 of the Federal Rules of Civil Procedure.

This is an appeal from the memorandum decision and order of Hon. James T. Foley to the second motion which the Court granted in favor of defendant, United States of America, by its decision of October 9, 1975. The appeal has been duly taken to this Court.

STATEMENT OF ISSUES

1. Did the motion papers and opposition papers raise a triable issue of fact? Yes.

2. Does the "discovery" rule apply to the instant case? Yes.

3. Does the "continuous treatment" rule apply to the instant case? Yes.

4. Under the "discovery" rule, is a Court able to determine from papers when a claimant discovered or, in the exercise of reasonable diligence, should have discovered the acts constituting the alleged malpractice? No.

5. Under the "continuous treatment" rule, is a Court able to determine from papers whether there was a doctor-patient relationship or not and when the treatment ended? No.

6. Did the Court err in granting summary judgment? Yes.

7. Should the Court reverse the lower Court's memorandum decision and order of October 9, 1975? Yes.

STATEMENT OF FACTS

On or about November 27, 1970, Joseph Anthony Camire, hereinafter referred to as the infant, was born to James Anthony Camire and Gail Marie Camire, hereinafter referred to as the father and mother, respectively, at the Plattsburgh Air Force Base Hospital. At the time the father was an E-3 in the United States Navy and the mother and infant were dependents of the father.

The infant was under pediatric care at the Plattsburgh Air Force Base Hospital. The mother brought the infant to the said hospital for the course of treatment normally given to an infant in his first year of development.

On or about April 15, 1971, the mother brought the infant to the Plattsburgh Air Force Base Hospital for post-natal care. The infant's medical problems were referred to the medical officer on duty. The mother had sought medical attention for the infant because the infant exhibited certain symptoms of high fever, vomiting and persistent crying. There were other symptoms that were not obvious but were demonstrated by the actions of the infant, to wit: convulsions and rigidity of the neck muscles. At the time of this examination the diagnosis was cutting teeth and a cold.

Three or four days later the mother returned to the Plattsburgh Air Force Base Hopsital and related to Dr. Marger a worsening of the medical condition. Dr. Marger informed the mother that she would have to be patient concerning the problem which he had diagnosed.

On or about April 22, 1971, the mother returned to the hospital and related similar or worse symptoms to Dr. Marger and requested advice concerning traveling with the infant. The doctor indicated that there was no danger in traveling.

Shortly thereafter the mother went to San Diego, California, to meet her husband who was returning from a Westpack Cruise. When the mother arrived in California, the infant was taken to the Balboa Naval Hospital in Balboa, California, at which

time the staff doctor suspected meningitis. The exact type of meningitis was undiagnosed due to the advanced stage of the illness and the masking of the organisms by pre-L.P. antibiotics. The mother was advised to obtain the Last Rites for the infant.

The infant was under the care and treatment of the U.S. Government at the Balboa Naval Hospital from approximately April 27, 1971, until February of 1973.

On or about June 6, 1972, the mother and the infant went to the Plattsburgh Air Force Base Hospital and she was advised to seek civilian medical care. It was at this time that the mother first became aware, from another medical source, that there had been a misdiagnosis and mistreatment of the infant. On or about July of 1973 the mother discussed the matter with attorney Livingston L. Hatch while she was discussing with him an unrelated matter concerning her brother. It was at that time that a medical malpractice claim was first discussed.

An administrative claim was duly filed and was denied by the U.S. Government and a summons and verified complaint were served. The U.S. Government, through its attorneys, moved to dismiss on the grounds that the plaintiffs failed to state a cause of action because statute of limitation questions under the Federal Tort Claim Act are jurisdictional matters which affect the merits of a cause of action. A motion was made by the U.S. Attorney before the Hon. James T. Foley and after

oral argument a memorandum decision and order were filed and an appeal was taken from that decision to this Court.

POINT I

THE COURT ERRED IN GRANTING THE DEFENDANT'S MOTION FOR SUMMARY JUDGMENT.

The two-year statute of limitation of the Federal Tort Claim Act (28 U.S.C. Section 2401(b)) is a jurisdictional statute in that the timeliness of a suit is a condition precedent to maintaining a claim against the United States of America. The failure to file a claim within two years of the accrual of the cause of action bars the maintenance of the suit. This rule is applied mechanically and eliminates many legitimate claims. The federal courts in the medical malpractice area have attempted to eliminate the harshness of this rule by adopting the "continuous treatment" doctrine and the "discovery" doctrine. The courts have not made exceptions because of infancy or certain disabilities except in a case involving a prisoner of war. Mann v. U.S. 39 Fed. 2d 672; Pitman v. U.S. 341 Fed. 2d 739; Cooper v. U.S. 442 Fed. 2d 908.

Quinton v. U.S. 304 Fed. 2d 234; Hungerford v. U.S. 307 Fed. 2d 99; Coyne v. U.S. 411 Fed. 2d 987; Ashley v. U.S. 413 Fed. 2d 490; Toal v. U.S. 438 Fed. 2d 222; Portis v. U.S. 483 Fed. 2d 670; Tyminski v. U.S. 481 Fed. 2d 258. A review of the cases cited will show that they stand for the proposition that the statute of limitation will not begin to run until the

claimant discovered or, in the exercise of reasonable diligence, should have discovered the existence of the acts of malpractice upon which the claim is based. The examination of the facts in each case has to be categorized into various classifications to fully understand the import of the decision. These classifications seem to be:

a) the status of the individual claimant;

b) the length of time between the occurrence of malpractice and the suit;

c) the opportunity of the claimant to discover the malpractice;

d) the background of the claimant; and

e) the nature of the malpractice.

The law in each one of these cases seems to be the same and consistent with a tendency to eliminate the consequences of the statute of limitations.

In the instant case, the Court makes a great deal about what was said to the mother by the doctor at the Balboa Naval Hospital and the fact that there is a great difference between a common cold and meningitis. The affirmations, affidavits and moving papers are limited in their ability to create the real situation between the parties and persons involved in this matter. The Court notes in its decision that there is a change in the facts from the time the notice of claim was drawn and the answering affidavits were prepared. The explanation is simple: the notice of claim was prepared without the benefit of the medical records; the complaint was prepared without the benefit of the medical records and information from the Balboa

Naval Hospital doctors. The answering affidavits were prepared with the help of the medical records, Balboa Naval Hospital doctors' information and discussions with and reports from Plattsburgh civilian doctors. A review of the exhibits set forth in this brief shows that meningitis has its origin in some cases from bacteria and in some cases the symptoms are that of pneumonia. A review of the medical records (Exhibits A and B, pages 47-101 of the record) will demonstrate that the information transmitted to the mother was scanty and incomplete. The medical records in the instant case were not in the hands of the Balboa Naval Hospital until July 13, 1971, (See page 84 of the record), and a review of the entire medical record will show that the medical personnel at the Balboa Naval Hospital went from bacterial meningitis to viral encephalitis in their attempt to diagnose the instant case. (See pages 51, 53, 81, 82, 83, 84 and 90 of the record.) The medical record will show that the meningitis and its particular organisms were masked by pre-L.P. antibiotics. (See page 53 of the record.)

The Court seems to say in its decision that the mother should have known the difference between a common cold and meningitis. The Court presumes she knew the difference and knew the obligation of the medical personnel at the Plattsburgh Air Force Base Hospital. A review of the exhibit at the back of the brief will show that meningitis and pneumonia demonstrate similar symptoms. Pneumonia consists of high fever, vomiting, sometimes convulsions and stiffness of muscles throughout the body. The lower Court does not have the benefit of any expert testimony other than opinions and admissions by the U.S. Attorney.

The Court also makes a great deal of the fact that the mother was told at a different hospital by a different doctor that it was suspected meningitis. The Court disregards the fact that meningitis has a unique character in that the incubation period can be anywhere from one to five days and the last time she saw Dr. Marger was on April 22, 1971, and the Court failed to consider the person to whom the doctor was telling this to. As her affidavit clearly states, she had no medical background and that for a period of approximately four months, as is reflected in the medical records, the child was on a critical list and the extent of damages was not known until later on in the course of treatment. It was not until a private physician, to whom the Plattsburgh Air Force Base Hospital had referred the case, was contacted was the question of untreated and undiagnosed meningitis raised. (See pages 95-101 and 108-109 of the record.) The Court appears to have expected the mother to have sought the assistance of a lawyer before that of a doctor: to have been concerning with the economics of the situation rather than the humanitarian aspects of saving her child's life. The lower Court refers to Brown v. U.S. 353 Fed. 2d 547. A review of that case shows that the parents sat idly by for a period of approximately seven years and four months before they commenced an action. The Court in that case, when reviewing the record, stated in its decision:

> "The parents then took the child to Bethesda Naval Hospital where different physicians informed them forthrightly and more precisely as to the child's condition and the cause." (Emphasis added.)

In the instant case nowhere in the record is there a forthright statement as to what the child actually had or a statement as to its cause. The only statement as to the cause is cited on pages 95-101 and 108-109 of the record. In the Brown case the malpractice and the cause of the malpractice was disclosed immediately to the parents. The Court in Brown (supra) does not tell us when the statute began to run, whether it was on May 5, 1955, or in 1956, when they were told of the cause.

The lower Court disregarded the prouncements in Jordan v. the U.S. 503 Fed. 2d 620. This case states:

> "Implicit in the federal cases applying this 'discovery' rule is the requirement that the claimant must have received some information, either by virtue of acts he has witnesses or something he has heard, or a combination of both, which should indicate to him, when reasonably interpreted in light of all the circumstances, that his injury was the result of an act which could constitute malpractice."

In the instant case the infant certainly could never meet those requirements. His fate was in the hands of his mother and was dependent upon her ability to understand and to interpret information which she received and witnessed. It appears that the "discovery" rule creates an issue of fact which has to be tried and cannot be summarily decided on moving papers and affidavits. Jordan (supra) appears to be taking

the law of federal tort claims into a new area in setting forth guidelines to decide and determine these issues.

In New York Law Journal, Tuesday, October 28, 1975, Column 3, Chief Judge Kaufmann admonishes the District Court Judges in their misuse and misinterpretation of cases under Rule 56 of the Federal Rules of Civil Procedure. This admonition came forth in Heymen v. Commerce and Industrial Ins. Co. 524 Fed. 2d 1317. The Court in that decision sets forth the rules of the Second Circuit relative to the granting of summary judgment.

It would appear that where the "discovery" rule is involved, the issues cannot be determined by summary judgment. The question of constructive knowledge is always one of fact. Dzenits v. Merrill, Lynch, Pierce, Fenner and Smith, Inc., 494 Fed. 2d 168. The question of "churning" and discovery of the same in a stock fraud case could not be handled summarily on affidavits. Also, the question of when the doctor-patient relationship ended cannot be handled summarily. Sheets v. Barman 322 Fed. 2d 277.

The lower court's memorandum order and decision of October 9, 1975, must be reversed and remanded to the lower court with instructions on the issue of statute of limitations, and the remanding must be before another trier of fact since the lower court has made a factual determination in the instant case.

POINT II

THE COURT ERRED IN ITS REFUSAL TO APPLY THE CONTINUOUS TREATMENT DOCTRINE TO THE INSTANT CASE.

In the law of medical malpractice the institutions which seem to be the subject matter of lawsuits are private profit-making institutions, public charitable not-for-profit institutions, municipal hospitals and federal hospital installations. It is obvious that we are not dealing with private profit-making institutions or public charity not-for-profit institutions. Their structures, medical setups and association rules and regulations have no applicability to the instant case. In the instant case we are not dealing with municipal hospitals, however, the similarity to federal hospital installations is quite close. 10 U.S.C. Section 1071 to 1085 are the sections that deal with and control medical and dental care for dependents of members of the uniform services. Section 1071 in the purpose clause provides a uniform medical program for all members of the military service and their dependents. Section 1073 makes the Secretary of Defense the chief administrator of those hospitals under his jurisdiction. The rules and regulations promulgated by the Secretary of Defense are applicable to all hospital facilities or facilities providing medical care and attention whether it be the Plattsburgh Air Force Base Hospital or the Balboa Naval Hospital. Section 1080 removes a certain amount of discretion on the part of the dependents in their seeking of medical care. Common experience dictates that

a person seeking military medical care does not establish a doctor-patient relationship with the medical personnel, but rather, takes his turn when seeking medical attention. In the instant case a reivew of the medical records will show approximately seven doctors attended the infant from the date of his birth to the date of his release from the hospital.

The lower Court applied the conventional "continuous treatment" doctrine set forth in a number of cases which were cited in the court's memorandum order. Kossick v. U.S. 33 Fed. 2d 933 is not on point in the instant case but shows that the Second Circuit has adopted the Borgia doctrine cited in Borgia v. City of New York 12 N.Y. 2d 151. The decision in Borgia (supra) seems to acknowledge the fact that the "continuous treatment" theory is essential because it would be absurd to require a wronged patient to interrupt corrective efforts by serving a summons on the physician or hospital superintendent or by filing a notice of claim in the case of a city hospital. It would appear that Borgia (supra) recognizes that in the "continuous treatment" rule the existence of a doctor-patient relationship is not necessary as long as there is a patient-hospital relationship. The case against Capt. Donald Marger, M.D., has been dismissed because the government immunizes him from responsibility for any acts which are performed within the scope of his authority. The federal law destroys the responsibility and obligation which run between a doctor-patient relationship and creates that of an employee-patient relationship. In the instant case, clearly

there is no choice on the part of the Camires in establishing this temporarily injurious relationship with Capt. Donald Marger, M.D.

The traditional concepts and relationships which have been established in medical malpractice cases are not or should not be applicable in federal tort claims malpractice cases. Brown v. U.S. (supra) and Ciccarone v. U.S. 486 Fed. 2d 253 do create and use the traditional concepts of a doctor-patient relationship and use the traditional relationship to frustrate legitimate liability causes of action against the U.S. Government. In the instant case, are the Plattsburgh Air Force Base Hospital and the Balboa Naval Hospital separate and distinct entities, or are they parts of a whole? A review of the above sections and the medical records will show that the relationship is that of parts of a whole and that the only differences between the Plattsburgh Air Force Base Hospital and the Balboa Naval Hospital are the names and the distance. The government in all probability will argue as to its separateness and distinctiveness for the purpose of this case. Robins v. U.S. Navy 342 Fed. Supp. 381 learned the difficult way by having their cause of action dismissed because they did not go to the appropriate federal agency, which in that case would have been the Secretary of Defense, but rather, went to the U.S. Navy, and the Court in that case did not use the separate entity approach.

A review of the records will show that from on or about April 15, 1971, up until February 13, 1973, the infant was under

the constant medical care for the injuries of the medical malpractice and the sequelae of injuries that flowed from it. There is no charge of conspiracy of silence, but the records did not indicate the doctor's opinion as to the cause. If the malpractice is so obvious that a layman should have known the difference, should not the doctor has reported it in his medical records? The infant in the instant case received constant care and treatment from the appropriate federal agency and its employees. The Court in Kossick (supra) implied that Kossick's cause of action would survive as long as he was a seaman. That argument is sound, however, the rules of "continuous treatment" require more than periodic visitations.

The Court erred in granting summary judgment as to the "continuous treatment" doctrine because in Sheets v. Barman (supra) Judge Wisdom said that summary judgment should not be granted when there is a question as to when the doctor-patient relationship began and ended. I am sure that the defendant will hide behind the doctor-patient relationship for the purpose of this motion, but in the event he is returned to the lower Court for trial, his defense will be that there was not sufficient contact between the plaintiff and the doctor to establish a doctor-patient relationship.

The Court should reverse the memorandum order of October 9, 1975, and remand the matter to the District Court for further proceeding.

CONCLUSION

The lower Court erred in its decision and the matter should be reversed and remanded with the appropriate instructions, and such other and further relief as the Court deems just and proper.

Dated: March 15, 1976

Respectively Submitted,

Livingston L. Hatch

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CHAPTER X

MENINGOCOCCAL MENINGITIS

(*Cerebrospinal Fever, Cerebrospinal Meningitis. Spotted Fever.* (In infants) *Posterior Basal Meningitis*)

An acute infectious disease, occurring sporadically and in epidemics, caused by the meningococcus, and characterized pathologically by purulent inflammation of the meninges of the brain and cord.

Note: The clinical course of the disease, as commonly seen, has been radically modified by chemotherapy.

Aetiology.—

AGE.—Incidence greatest up to 5 years, in normal circumstances.

SEASON.—Highest in first half of year: attributed to confinement in lwellings and prevalence of colds and coughs. Transmission facilitated by low absolute humidity.

Mode of Infection.—Animals are not susceptible (except monkeys experimentally): hence infection is solely from man to man; *spreads by droplet infection*; fomites are not infectious. Infection is from 'carriers', direct infection from a patient being very rare. Epidemics thus spread irregularly, cases apparently being unconnected. Human susceptibility is not great.

'CARRIERS'.—May be: (1) Convalescent carriers: subsequent to an attack: cultures (from nasopharyngeal swabs) usually negative in a few weeks: rare cases become chronic carriers. (2) Chronic carriers: few only have had symptoms, or develop them; unhealthy nasopharyngeal mucosa common. Susceptibility is low. In a healthy population, 5 per cent may be carriers: cases may begin to be frequent when carrier rate is 20 per cent; but a high carrier rate in a community, even 50 per cent, is not necessarily associated with increase of cases, the virulence of the strain being also a factor. The 'carrier rate' among soldiers increases as distance between bunks is decreased. Cubic space is a lesser factor.

TREATMENT.—Oral administration of sulphonamides is effective.

PATH OF INVASION.—Nasopharynx is infected initially. Next stage is meningococcal septicaemia (onset of symptoms) followed by stage of localization in meninges. Direct spread to meninges by lymphatics from infected sphenoidal sinus is improbable path.

Bacteriology.—*Diplococcus intracellularis meningitidis*, or *Meningococcus*, discovered by Weichselbaum in 1887. Now named *Neisseria meningitidis* or *intracellularis*. Dies rapidly outside body. Must be distinguished from gonococcus, *Micrococcus catarrhalis* (meningococcus forms acid in glucose and maltose), and *Diplococcus mucosus* (slimy colonies).

MORPHOLOGY.—Mainly in pairs. In cerebrospinal fluid and pus most but not all the organisms are within the leucocytes (intracellular). Shape either round or flattened. Gram-negative. Thus closely resembles gonococcus.

CULTURES.—Grow most readily on Gordon's 'trypagar'; large colonies, somewhat opaque. Less readily on ascitic agar. On ordinary agar growth more delicate and often fails. Cultures die readily, and subcultures are necessary every few days. *Involution forms* are common in cultures, cocci being swollen and staining badly. Identify cultures by agglutination.

GORDON'S TYPES OF MENINGOCOCCI.—Four types can be separated, divisible into two groups. As chemotherapy is effective against all strains (as at present known) typing is now unimportant.

PRESENCE AND ISOLATION OF MENINGOCOCCUS.—

1. Nasopharynx and accessory sinuses in 'carriers'.
2. Blood in early stage of disease. Isolated in about 25 per cent.
3. Cerebrospinal fluid during disease.

Rarely isolated from nasopharynx during disease.

AGGLUTININS.—Appear in blood about fourth day: to infecting strain only.

ANTISERA.—Produced in horses and monkeys: only effective against homologous strain.

Morbid Anatomy.—General characteristic is a suppurative inflammation of pia-arachnoid, especially at base of brain. Very acute infections may be fatal before significant meningitis develops.

CEREBRAL MENINGES AND BRAIN.—Pia-arachnoid injected, and purulent exudate in subarachnoid spaces, especially at base. On cortex often much lymph, especially in larger depressions. Brain substance soft and pink; may be foci of haemorrhages. Ventricles distended with fluid

Morbid Anatomy, *continued.*

or even with pus. Microscopically, infiltration along vessels and other channels, and may be foci of encephalitis.

SPINAL CORD.—Always affected, especially posterior surface, and in dorsal and lumbar regions. Pus may surround all the cord, and even nerve-roots.

In more chronic cases *meninges* are thickened and remains of exudate present. Cranial nerves usually involved. *Ventricles* may be greatly distended with clear or turbid fluid, and foramen of Magendie closed.

MENINGOCOCCAL ENCEPHALITIS.—May occur without meningeal involvement in fulminating cases.

OTHER ORGANS.—In fulminating cases haemorrhages often present in adrenal cortex (Waterhouse-Friderichsen syndrome). Spleen occasionally enlarged. May be terminal pneumonia.

Duration of Infectivity.—Until nasopharyngeal swabs give negative result.

Quarantine Period.—Seven days.

Symptoms.—

INCUBATION PERIOD.—From 1 to 4 or 5 days.

GENERAL COURSE.—Commences as septicaemia, subsequent progress being: (1) Fulminating septicaemia without localization; (2) Septicaemic stage transient, followed by cerebrospinal localization—is ordinary type; (3) Septicaemic stage chronic without immediate localization—chronic meningococcal septicaemia.

MODES OF ONSET.—(1) *Ordinary type*: Sudden onset. Condition becomes progressively worse, suggesting cerebrospinal meningitis in 24 hours, signifying progress from septicaemia to meningeal localization. (2) *Fulminating type*: Abrupt onset. May be mania. Progress very rapid. Comatose within few hours. (3) Chronic meningococcal septicaemia.

Ordinary Form.—*Onset*: Sudden, with cardinal symptoms of *headache*, *vomiting*, and *pyrexia*, with rigors, and, in children, convulsions. Temporary improvement occasionally follows onset. *Stiffness of neck*, head retraction, and general irritability develop. General condition of irritation of the nervous system and increased intracranial pressure. Symptoms usually take 1 to 5 days to develop, and remain at height for 1 to 3 weeks in absence of chemotherapy. Rash often develops after 1 week. Spleen may be palpable.

MOTOR SYMPTOMS.—

1. HEAD RETRACTION.—May be extreme. In infants, opisthotonos.
2. RIGIDITY.—(i) Kernig's sign, rarely absent. (ii) Brudzinski's 'neck sign'; if the head is flexed by the hand, with the patient lying on his back, flexion of the knees and thighs occurs (a valuable sign of meningitis). (iii) Brudzinski's 'leg sign': if one leg be flexed, flexion also occurs in the opposite leg.
3. REFLEXES.—Deep reflexes (knee-jerks) usually increased but may be absent. Babinski's sign in about 10 per cent.
4. SPASMS.—Commence as twitching, increasing to clonic or tonic spasms. Spasms or paralysis of face muscles. Tremor common.
5. OCULAR SYMPTOMS.—(i) Pupils: Usually dilated, from irritation of sympathetic; may be contracted, in severe forms. Inequality and sluggish reaction common. Hippus not infrequent. (ii) Strabismus: In about 20 per cent. (iii) Optic neuritis: Uncommon; about 10 per cent. Photophobia, conjunctivitis, ptosis, nystagmus occasionally.

SENSORY SYMPTOMS.—Headache often very severe, especially occipital. Pain may extend along spine and limbs; may be severe lumbar pain with hyperaesthesia. General hyperaesthesia may occur.

PSYCHICAL SYMPTOMS.—At onset restlessness, mania, or delirium, later stupor and coma.

VOMITING.—Of the cerebral type, very frequent at onset, may continue or subside later.

TEMPERATURE.—Irregular, no typical course, remissions and intermissions common; may rise to 105° or over; about 103° usual.

PULSE.—Slow in relation to temperature, may be irregular.

RESPIRATION.—Towards termination may be Cheyne-Stokes. Only increased with pulmonary complications.

ERUPTIONS.—

1. HAEMORRHAGIC RASH.—Onset early, first or second day. Either (*a*) petechial, or (*b*) purpuric (fulminating cases only). Rare.
2. ERYTHEMA AND PAPULAR ERUPTIONS.—Pink papules may resemble typhoid or macular eruption like measles.
3. HERPES LABIALIS.—In 25–50 per cent. Onset not before fourth or fifth day.

BLOOD.—Polynuclear leucocytosis, 25,000–50,000 per c.mm. Leucocytosis may be absent in fulminating cases.

EMACIATION.—Often very rapid.

Other Clinical Types.—

1. FULMINATING FORM. - *Acute septicaemia.* Abrupt onset: headache, vomiting, collapse: purpuric rash common. Temperature high or low. *Rapid coma.* Cerebrospinal fluid may be clear and contain no cocci. May be due to haemorrhage in cortex of adrenals (Waterhouse-Friderichsen syndrome); meningeal symptoms slight or absent; abdominal symptoms may occur. Meningococcal encephalitis may also be fulminating.

   Note: Cases with rapid onset of coma often respond to sulphonamides or penicillin.

2. CHRONIC MENINGOCOCCAL SEPTICAEMIA.—Not uncommon; often overlooked.

   Onset usually sudden: headache, rigors, muscle and joint pains. Blood cultures may be negative.

   Eruption: Usually within few days, rarely absent. Appears in successive crops, often tender. Various types, e.g.: (1) erythema nodosum, may be indistinguishable but often wider distribution; (2) papular, may be petechial; (3) pink macules, resembling enteric or larger.

   Temperature: No distinctive course. Often higher periods. May closely simulate malaria.

   If untreated may persist for weeks or months without serious malaise. May suggest influenza, typhoid, rheumatism, erythema nodosum, or trench fever.

   Terminates dramatically with chemotherapy, but, if untreated, meningitis may develop.

MILD AND ABORTIVE FORMS.—Symptoms mild or subsiding in a few days.

CHRONIC FORMS.—Recrudescences may occur over many months. Other chronic forms are associated with closure by meningitis of the foramina of Magendie and Luschka: the ventricles are distended either with pus, turbid fluid, or clear fluid, constituting 'closed ventricular meningitis' or hydrocephalus. Complex nervous manifestations, emaciation, disturbances of pulse and respiration: recovery impossible. Common in posterior basal meningitis.

POSTERIOR BASAL MENINGITIS.—Cerebrospinal meningitis in infants. Commonest form of meningitis under age of 1 year. Onset sudden or insidious. *Note*: (1) Head retraction and opisthotonos marked; (2) Rash rare; (3) Loss of vision without optic neuritis common; (4) Often very chronic; (5) Sequelae usual in non-fatal cases: deafness and hence deaf-mutism, blindness, mental deficiency, general spasticity of extremities (hydrocephalus). Lumbar puncture in chronic cases often gives 'dry tap', from closure of foramen of Magendie. Possibly many cases are sequel of overlooked acute attack with closure of foramen of Magendie.

PROGNOSIS.—Poor when chronic symptoms present: in acute stages amenable to sulphonamides.

Complications and Sequelae.—

Without chemotherapy:—

NERVOUS SYSTEM.—Facial paralysis, hemiplegia, and paraplegia occur rarely: recovery usual. In the chronic forms and hydrocephalus, attacks occur with headache, vomiting, mental dullness, and dilated pupils.

ARTHRITIS OR SYNOVITIS.—Occurs in 5–10 per cent: a previous haemorrhagic rash is almost invariable. Suppuration is rare and prognosis good.

EAR.—Deafness not uncommon, and often permanent, probably from affection of internal ear and auditory nerve. Otitis media also not uncommon.

RARE COMPLICATIONS.—Pericarditis. Pneumonia. Epididymitis.

RECRUDESCENCES.—Common in untreated or inadequately treated cases. True relapses rare.

With chemotherapy:—

Complications rare. Headache may develop if convalescence unduly short.

Cerebrospinal Fluid.—

CHARACTERS.—(1) *Amount increased* and under abnormal pressure; (2) Fluid *turbid* or purulent; (3) *Protein increased*; (4) *Polynuclear leucocytes* present in deposit (lymphocytes in early stages); (5) *Meningococci* present, intra- and extracellular—but may be absent even with turbid fluid; (6) *Dextrose absent*: the cause of this is doubtful, possibly fermented by meningococci, or due to action of leucocytes. The fluid may be clear for the first 24 hours. In later stages, with closure of foramen of Magendie by meningitis, amount of fluid may be scanty. Mixed infections occasionally occur, usually pneumococci.

Diagnosis.—

CLINICAL CHARACTERISTICS.—At onset: headache, vomiting, pyrexia, stiffness of neck, and delirium: development of head retraction. Eruption.

SPECIAL METHODS.—(1) Lumbar puncture: pathognomonic except occasionally in first 24 hours. (2) Blood-count and blood-culture: of less value.

Diagnosis, *continued.*

DIAGNOSIS FROM.—(1) Other conditions which produce meningeal symptoms: typhoid fever, pneumonia, influenza, otitis media. (2) Other causes of meningitis: tuberculous, septic, or pneumococcal. (3) Acute poliomyelitis. (4) Encephalitis lethargica. (5) Typhus, and rarely other conditions with purpuric eruptions. (6) Subarachnoid haemorrhage (may recur).

Course and Prognosis.—Rapid improvement with sulphonamides. Symptoms disappear and temperature usually normal in few days even with severe onset. *Mortality* should not exceed 10 per cent under favourable conditions: mainly under 2 years of age and fulminating cases. *Convalescence*: often uneventful; may be headaches, giddiness, and nervous symptoms. Final results good; chronic forms and serious complications rare. *Serious features*: (1) Infancy; (2) Fulminating forms with early coma; (3) Purpuric eruptions. Temperature has little prognostic value. Condition of cerebrospinal fluid of little value: pus and cocci may disappear rapidly. *Mortality without sulphonamides*: not under 30 per cent; many complications and sequelae.

Prophylaxis.—

1. GENERAL HYGIENE.—Fresh air and sufficient cubic space in barracks, etc.
2. ISOLATION OF PATIENT.—For 2 weeks from onset of chemotherapy. Attendants must wear masks.
3. CONTACTS.—Immediate contacts only (as decided by responsible medical practitioner) should be kept under observation for 6 days: little practical value in swabbing throats.
4. CARRIERS.—Carrier rate in a population may be 10–50 per cent. Complete isolation and elimination of carriers impossible. Swabbing of throats in search for carriers is of little practical value.
5. Course of penicillin or sulphonamide advised for contacts and carriers.

Treatment.—

SULPHONAMIDES.—Specific treatment. Commence immediately on clinical diagnosis. High dosage at onset to obtain high concentration in blood and cerebrospinal fluid (10–15 mg. and 5 mg. per 100 ml. respectively).

DOSAGE (adults).—(1) Intravenous: initial loading dose 30–60 mg. sulphadiazine per kg. body-weight (2–4 g.); (2) Oral: continue: 2 hours later 1–2 g.; subsequently 1 g. every 4 hours. *Subsequent days*: usually give 1–1½ g. every 4 hours for 3 days. May continue 1 g. every 4 hours for further 3 days.

PENICILLIN.—Effective, but inferior to sulphonamides. Indications, combined with sulphonamide: (i) Diagnosis doubtful at onset; (ii) In infants; (iii) In fulminating infections. Give ½ mega unit every 3–4 hours until clinical recovery then tail dosage off.

LUMBAR PUNCTURE.—Should be performed to confirm diagnosis and, if necessary, to judge progress. Repetition unnecessary therapeutically.

Groups A and C, but not yet from B. After very careful graduated trials, Group C meningococcal polysaccharide vaccine was made a routine for all American military recruits in single subcutaneous doses of 50 μg. Disease caused by this serogroup has all but been eliminated from that population. Currently, field trials with Group A polysaccharide vaccine are under way, and the early results are encouraging. The duration of protection has not yet been established, nor has either effectiveness or usefulness been defined in children. Measurable responses to polysaccharide vaccines are quite different and less in children (especially under two years) than adults. No polysaccharide vaccine has been licensed, and thus such vaccines are not yet available for general use.

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201. BACTERIAL MENINGITIS

Robert G. Petersdorf

Definition. Meningitis is an inflammatory process involving the coverings of the central nervous system. Bacteria, viruses, spirochetes, parasites, and fungi may be the offending pathogens. This chapter is concerned with meningitis caused by bacteria other than meningococci and mycobacteria; these are discussed in Ch. 200 and 236, respectively.

Etiology. With the exception of *Mycobacterium tuberculosis*, the three most common microorganisms causing meningitis are *Diplococcus pneumoniae, Neisseria meningitidis*, and *Hemophilus influenzae*. The meningitis caused by *H. influenzae* is usually of type B and occurs uncommonly after the age of 6 and rarely after 12. When it occurs in adults, a deficiency in immune globulins, a parameningeal focus, or head trauma should be suspected. Meningococcal disease is found in both children and adults, but is rare after the age of 50. Pneumococcal meningitis is most common in infancy and old age. Other, less common pathogens are *Staphylococcus aureus*, which is usually found in association with epidural or brain abscess, in thrombosis of the cavernous sinus, or after cranial trauma and neurosurgical procedures; *Escherichia coli*, a common offender in meningitis in newborns; and other enteric organisms, including Proteus species, Klebsiella-Enterobacter, Paracolon, Salmonella, and Pseudomonas. Infection with Pseudomonas has followed lumbar puncture, spinal anesthesia, and the establishment of shunting procedures to relieve hydrocephalus. Gonococcal meningitis, which is quite indistinguishable from meningococcal infections, is being reported with increasing frequency. The group A Streptococcus, formerly a common offender, is now a relatively rare cause of meningitis, although enterococci and anaerobic streptococci continue to be isolated, primarily from patients with brain abscess and meningitis. Rarer organisms include *Listeria monocytogenes*, a small gram-positive rod resembling nonpathogenic diphtheroids; *Mima polymorpha*, a pleomorphic gram-negative organism that is difficult to differentiate on Gram stain (but not culture) from *H. influenzae* and *N. meningitidis*; and *Cl. perfringens* and *Past. multocida*.

Incidence. The precise incidence of bacterial meningitis is difficult to determine, because, except for meningococcal infections, meningitis is not reportable. There appears to be a decrease in incidence of all forms of meningitis except perhaps for *H. influenzae*. However, the mortality rate has remained relatively constant. This may reflect the susceptibility of aged or "poor risk" patients to meningeal infections. Like many infections, most forms of bacterial meningitis are more prevalent among individuals of low socioeconomic status.

Pathology. There is considerable variation in the pathologic picture, depending in part on the duration of the disease, the infecting organism, the resistance of the host, and the type and duration of therapy. Although bacterial meningitis is usually localized to the subarachnoid space, infections caused by viruses, spirochetes, parasites, and fungi are commonly complicated by cerebritis or encephalitis. In bacterial meningitis, grossly purulent exudate is present over the cortical and basal surfaces of the brain, and may invest the spinal cord as well. The pus is often localized to the cerebellopontine angles. Cortical phlebitis with its consequences of vascular congestion, thrombosis, and infarction may be prominent findings. Microscopically, exudate consisting of several hundred layers of polymorphonuclear leukocytes is present over the surface of the brain and in the ventricular system, where the pus may produce noncommunicating hydrocephalus. Occasionally, the exudate penetrates the arachnoid, forming a subdural empyema. Although migration of inflammatory cells into subjacent neuronal tissue and necrosis of nerve cells may occur, in general, the meninges provide remarkable protection to the neurons, which are usually spared from the inflammatory process and invasion by bacteria.

Pathogenesis. The routes by which microorganisms penetrate the blood–cerebrospinal fluid barrier and establish infection in the subarachnoid space have not been clearly defined. In a number of instances, bacterial meningitis follows infection of the middle ear, mastoid, paranasal sinuses, and trauma or surgery to the face and head. In these instances, it seems likely that bacteria enter through a rent in the leptomeninges or that infection in a neighboring focus may render the meninges more permeable to microorganisms. Pneumococci, streptococci, staphylococci, and (more rarely) *H. influenzae* and gram-negative enteric bacilli have been implicated in this type of meningitis. Meningococci, which are usually carried in the nasopharynx, have been assumed to ascend to the meninges via the small venules and via arachnoid sheaths investing the olfactory nerves and accompanying them through the lamina cribrosa. However, there is no direct evidence for this route of infection in man. It has been postulated that infection emanating from distant foci, such as pneumococcal meningitis that follows pneumonia, or infection without a primary focus, is blood borne. In laboratory animals,

bacteremia is not associated with meningitis unless the meninges are subjected to microtrauma (in the form of needle puncture) at the height of bacteremia. It is conceivable that this situation exists in man and that a microscopic defect in the meninges is a prerequisite for entry of bacteria from the blood. Occasionally, meningitis follows the rupture of a brain abscess. Anaerobic streptococci, enterococci, staphylococci, mixtures of bacteria, and actinomycetes may be isolated under these circumstances.

Clinical Manifestations. *History.* Most patients with meningitis report fever, lethargy, confusion, headache, vomiting, or stiff neck. The mode of onset may vary. Some patients rapidly develop headache, confusion, and loss of consciousness within 24 hours; they usually do not have antecedent respiratory symptoms. Others complain of headache, fever, and stiff neck associated with otitis, rhinorrhea, sore throat, or cough for one to seven days prior to the appearance of the full clinical picture. Still others have symptoms referable to the respiratory tract for several weeks before meningitis sets in. *Cough* is a common symptom in pneumococcal meningitis which is often accompanied by pneumonia; *earache* often antedates infection with *H. influenzae*, and a *sore throat* may precede neisserial meningitis. Other symptoms of bacterial meningitis include backache, weakness, dizziness, ataxia, photophobia, and generalized myalgias. Additional clues are a history of sickle cell disease, a common accompaniment of pneumococcal meningitis in children; previous or recent infection or surgery involving the nose, throat, or sinuses; head trauma; recent lumbar puncture or spinal anesthesia; and close and intimate contact with a patient who has a meningococcal infection.

Physical Findings. Most patients demonstrate the signs of meningeal irritation, i.e., stiff neck and positive Kernig or Brudzinski signs. Patients without these signs are often very young, very old, or severely obtunded. A *petechial eruption* is relatively rare in meningitis caused by bacteria other than meningococci unless bacterial endocarditis is present. There may be physical signs of pneumonia, particularly in patients with pneumococcal meningitis, and evidence of aural infection may also be found. Often, however, a primary focus (otitis, mastoiditis, sinusitis, pneumonia, or empyema) is not apparent on physical examination and should be carefully sought by other means, because failure to eradicate the primary focus may result in failure of therapy or post-treatment relapse. Although intracranial pressure is characteristically elevated, papilledema is rare. When it is encountered in the course of acute bacterial meningitis, it should call to mind the possibility of subdural empyema, brain abscess, or venous sinus thrombosis. The level of consciousness in most patients with meningitis may vary from confusion and mild lethargy to deep coma. About 10 to 15 per cent are remarkably alert. In approximately 50 per cent, however, other signs of neurologic damage develop during the course of infection. These include major motor seizures, hemipareses, which are often transient and probably postictal, signs of diffuse central nervous system damage (bilateral Babinski signs and fixed, mid-stage pupils), or paresis of the second, third, sixth, seventh, and eighth cranial nerves.

Associated Disease. With the exception of epidemics of meningococcal meningitis, which are usually confined to closed environments such as army camps or schools, bacterial meningitis occurs sporadically, usually in a setting of some associated disease. Pharyngitis antedates meningitis in many patients with meningococcal and Hemophilus infection. Otitis with or without mastoiditis, although much rarer nowadays than 20 years ago, remains an important precursor of Hemophilus and pneumococcal meningitis, which is also frequently associated with pneumonia. Pneumonitis is also often present in meningitis caused by gram-negative pathogens. A number of patients with pneumococcal meningitis have multiple myeloma, patients with this neoplasm are generally prone to recurrent pneumococcal infections. A similar propensity has been described for children with sickle cell disease. In addition to the common meningeal pathogens, meningitis in patients with diabetes mellitus is likely to be caused by uncommon organisms such as Klebsiella-Enterobacter, and *Staphylococcus aureus*. Enteric bacteria not uncommonly are seen in meningeal infections among patients with leukemias or lymphomas. Cranial trauma may precede meningitis by several days and occasionally months or years; in such instances *D. pneumoniae*, hemolytic *Staph. aureus*, or coliform bacteria are usually the offending organisms. Cranial osteomyelitis may intervene between head trauma and the development of meningitis. Patients undergoing shunt procedures for relief of hydrocephalus tend to have infections with bacteria that are ordinarily not pathogenic such as *Staphylococcus epidermidis* or micrococci; gram-negative enteric bacterial and Pseudomonas meningitis also complicate shunting procedures. Occasionally, subcutaneous or mucosal infections such as furunculosis, decubitus ulcers, omphalitis in neonates, and endometritis precede leptomeningitis.

Rare Types of Meningitis. MIMA POLYMORPHA MENINGITIS. *Mima polymorpha* is a gram-negative pleomorphic bacillus that is easily confused on Gram stain with members of the Neisseria group and *H. influenzae*. It can be separated from these organisms, however, by cultural and serologic techniques. Meningitis caused by *Mima polymorpha* closely resembles meningitis caused by the more common pathogens and cannot be differentiated from them on clinical grounds. Separation of mimae from Neisseria is of more than academic importance because mimae may be resistant to penicillin and sulfonamides and respond only to the tetracyclines.

LISTERIA MENINGITIS. The most common clinical illness caused by Listeria is meningitis, and any patient with clinical and laboratory evidence of meningeal infection said to be caused by a diphtheroid should be assumed to harbor Listeria in the cerebrospinal fluid. Clinically, the illness cannot be distinguished from meningitis caused by other bacteria (see Ch. 222).

OTHER ORGANISMS. Bacteria that have caused infections usually in patients with antecedent head trauma or neurosurgical procedures include *Cl. perfringens* and *Past. multocida*, although any organism can occasionally produce infection in this setting.

Recurrent Meningitis. Recurrent bouts of meningitis are most frequently related to remote as well as to recent head trauma. The individual episodes are usually caused by the same bacterial species that are associated with meningitis occurring in the absence of trauma, except that pneumococci of higher serologic types are isolated most commonly, and may account for 80 per cent of these infections. Bouts of meningitis may be separated by an interval of several years. Cerebrospinal fluid rhinorrhea owing to a defect in the cribriform plate is often as-

sociated with recurrent meningeal infection. These patients also usually have evidence of a recent or remote skull fracture involving the frontal bone. All patients with repeated bouts of meningitis should be subjected to vigorous search for a communication between the subarachnoid space and the nasopharynx. This should include laminagrams of the frontal and ethmoid bones, and instillation of radioiodinated albumin or a dye such as indigo carmine intrathecally, followed by testing for these substances in nasal secretions. Testing these secretions with glucose oxidase (Dextrostix) may give a positive test, connoting CSF rhinorrhea.

Rarer situations predisposing to recurrent meningeal infections include chronic mastoiditis or petrositis, congenital abnormalities of the cranial vault, and congenital dermoid sinus tracts. Ventriculomastoid shunts aimed at relief of hydrocephalus are also complicated by recurrent infections, which are often heralded by otitis media. Recurrent bouts of meningitis have been reported in children who have undergone splenectomy; this does not appear to be true of adults. Nor is there evidence that the incidence of meningitis is increased in children with hypo- or dysgammaglobulinemia.

Infections with Multiple Organisms. Meningitis caused by two or more organisms occasionally occurs in infants, young children and neonates, who may develop brain abscesses after surgery or birth trauma. *H. influenzae* is usually one of the organisms, and has been found in conjunction with *N. meningitidis, D. pneumoniae,* group A Streptococcus, and *E. coli.* In adults infections with multiple organisms most commonly follow rupture of a brain abscess into the subarachnoid space, and streptococci, staphylococci, and gram-negative enteric pathogens may all be isolated from the same specimen of cerebrospinal fluid.

Complications of Bacterial Meningitis. *Disseminated Intravascular Coagulation.* This syndrome, which is also called consumptive coagulopathy, is manifested by multiple petechiae, ecchymoses, purpura, bleeding from other surfaces, hypotension progressing to shock, and gangrene of distal extremities (see Ch. 200).

Although fulminant meningococcemia, (with or without meningitis) is an important cause of disseminated intravascular coagulation (DIC), other gram-negative infections (particularly when accompanied by endotoxin shock), pneumococcal bacteremia in asplenic patients, Rocky Mountain spotted fever, disseminated herpes and congenital rubella, and falciparum malaria are among the other infectious causes of this syndrome. (See also Ch. 801.)

Clinical manifestations of DIC are due to the consumption of platelets and clotting factors and the anticoagulant effects of fibrin degradation products, leading to actual or potential bleeding; the deposition of fibrin, resulting in capillary thrombosis and ischemic infarction; and the distribution of red cells, leading to microangiopathic hemolytic anemia. Treatment should be directed at the underlying meningococcal infection.

Temporal and Cerebellar Herniation. These complications are commonly found in fatal meningitis, and may be recognized by distinct respiratory, ocular, and motor signs that indicate loss of diencephalic, midbrain, pontine, and medullary function in an orderly rostral-caudal sequence. In the presence of these signs, repeated lumbar punctures should be avoided.

Endocarditis. Endocarditis, most often involving the aortic valve, is found in 10 to 15 per cent of fatal cases of pneumococcal meningitis. Pneumonia is also frequent in this setting. Rheumatic or congenital valvular disease may antedate development of endocarditis, but frequently normal valves are involved. Staphylococci and coliform organisms and gonococci may also be the cause of the endocarditis-meningitis syndrome. Endocarditis may be difficult to detect clinically but should be seriously considered in patients with meningitis, pneumococcal, staphylococcal, gonococcal, and coliform bacteremia, and heart murmurs. The appearance of an aortic diastolic murmur when none was present previously is diagnostic of endocarditis in this setting.

Purulent Arthritis. Purulent arthritis may complicate pneumococcal, meningococcal, and staphylococcal meningitis. In general, it responds to antimicrobials, although aspiration of synovial fluid may be necessary.

Subdural Effusions. Subdural effusions have been a frequently reported complication of Hemophilus meningitis, but may also follow other types of meningitis in children. Prolonged unexplained fever, confusion despite adequate antimicrobial therapy, and convulsions after the apparent subsidence of infection are classic manifestations of accumulating subdural fluid that is usually sterile. Aspiration of this fluid, which may need to be repeated, results in relief of symptoms.

Neurologic Residua. Residual damage to the nervous system occurs in 10 to 20 per cent of patients, and is most common after pneumococcal meningitis in adults and *H. influenzae* meningitis in children. *Deafness* remains the most common sequel of pyogenic meningitis; hemiparesis, convulsive disorders, and dementia are seen occasionally.

Diagnosis. *General Considerations.* The diagnosis of bacterial meningitis is not difficult, provided a high index of suspicion is maintained. Meningeal infection should be considered in every patient with a history of upper respiratory illness interrupted by vomiting, headache, lethargy, confusion, or stiff neck. When first seen, some of these patients present only with low-grade fever, mild headache, or occasional emesis. Nevertheless, the possibility of meningeal infection must be carefully considered. In patients with pneumonia it is particularly dangerous to ascribe confusion to age or "toxemic" depression. Meningitis may be present in addition to pulmonary infection, and the dosage of antimicrobial drug used to to treat pneumonia is often inadequate to control meningeal infection. The susceptibility of alcoholics to pneumococcal meningitis cannot be emphasized too strongly, and may be related to the high prevalence of pneumonia in this group. Fever and confusion in these patients should not be attributed to alcoholic intoxication, delirium tremens, or hepatic encephalopathy unless the cerebrospinal fluid has been examined.

Two unusual types of recurrent meningitis may mimic bacterial infection, at least initially. *Mollaret's meningitis* consists of recurrent febrile attacks, malaise, headache, and meningeal signs accompanied by a marked polymorphonuclear inflammatory reaction in the CSF. Attacks last two to three days and subside spontaneously. *Behçet's syndrome* is characterized by recurrent oral and genital ulcerations and relapsing ocular lesions along with meningitis. Other neurologic abnormalities may include cranial nerve palsies, seizures, hemiparesis, extrapyramidal signs, and chronic brain syndromes.

Cerebrospinal Fluid. The cerebrospinal fluid should be examined in any patient with evidence of meningeal irritation. In patients with papilledema or other evi-

should, for all practical purposes, eliminate multiple drug therapy in "undiagnosed meningitis." A few "ampicillin failures" have been reported in children with *H. influenzae* meningitis. These were probably related to inadequate dosage or poor absorption of the drug, although a few resistant strains of *H. influenzae* have been reported. Staphylococcal meningitis should always be treated with one of the penicillinase-resistant penicillins, e.g., methicillin, oxacillin, or nafcillin in dosage of 6.0 to 12.0 grams parenterally. For the rare cases of meningitis caused by the Enterobacteriaceae or Pseudomonas, gentamicin in dosage of 5 mg per kilogram parenterally plus 4 to 8 mg intrathecally is the regimen of choice.

In patients with mastoiditis, an infected ventriculomastoid shunt, or cranial osteomyelitis, surgical attack on these primary foci while the patient is receiving appropriate antimicrobial therapy is indicated, but may be postponed until the acute meningeal episode is over.

Duration of Therapy. The duration of antimicrobial therapy in meningitis cannot be prescribed categorically. The cerebrospinal fluid should be examined every 24 to 48 hours during the early days of therapy, but once the patient is recovering, the intervals between lumbar puncture may be as long as a week, and numerous examinations of the CSF are rarely necessary. In the absence of extrameningeal foci, a seven- to ten-day course of antimicrobial therapy should suffice.

Other Measures. If there is evidence of increased intracranial pressure, and supratentorial or cerebellar herniation, therapy with mannitol, urea, or dexamethasone should be instituted. Adrenal cortical hormones also have been used as an adjunct to antimicrobial therapy, but have not resulted in noteworthy improvement. They should never be used unless the etiologic organism has been clearly identified and the appropriate drug is being administered. There have been some enthusiastic reports about proteolytic enzymes in the treatment of pneumococcal meningitis, but these agents have not been evaluated in sufficient detail to recommend their general use.

Other supportive therapy includes administration of adequate but not excessive parenteral fluids and anticonvulsants when indicated. Sedation should be employed with caution, even for delirious patients; of the many agents available, paraldehyde continues to be safe and effective.

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202. HEMOPHILUS INFLUENZAE INFECTIONS

Walsh McDermott

Although principally a pathogen for young children, *H. influenzae* may occasionally cause serious disease in the adult. In addition, the microbe is frequently present as a secondary "invader" in chronic obstructive lung disease and has played a similar role in the past in epidemics of presumed viral influenza. Virtually all severe primary infections are caused by serotype b, although other types may be present in the secondary "invader" role. The microbe is recognized as the most frequent cause of purulent meningitis in children; it is also the cause of a form of croup known as *obstructive laryngitis with epiglottitis*. Both conditions are quite serious. The *meningitis* is described in Ch. 201. The *laryngitis/epiglottitis* presents quite a characteristic picture. The onset is sudden and the course fulminating. Mild fever and dysphagia develop during an apparently innocuous respiratory infection. Dyspnea starts abruptly, and laryngeal obstruction requiring tracheotomy develops. High fever develops along with laryngeal redness and edema, and when the tongue is pressed downward, the enlarged, distorted, red, and edematous epiglottis is easily seen.

The diagnosis of an *H. influenzae* infection can be made rapidly by microscopy of Gram-stained smear or the demonstration of capsular swelling (quellung) of bacterial cells found in the appropriate biologic fluid. For initial culture, chocolate agar incubated in a candle jar may be used. Further cultural studies may be necessary of autoclaved blood agar, or yeast agar extract.

Therapy of the laryngitis/epiglottitis in children should be prompt and should include tracheostomy and appropriate antimicrobial therapy. Treatment of the meningitis is discussed in Ch. 201. Ampicillin, tetracycline, and chloramphenicol are all effective agents. As it has not been possible to demonstrate the superiority of any one drug in clinical trials (Nelson et al., 1972; Barrett et al., 1972), it seems advisable to use ampicillin.

Another disease caused by Hemophilus is *chancroid*, which is a localized venereal disease caused by *H. ducreyi*. It is characterized by painful, nonindurated ulceration involving the genitalia, accompanied by enlargement and suppuration of regional lymph nodes. Early syphilis often occurs simultaneously with chancroid. Tetracycline and erythromycin are both quite active against *H. ducreyi;* they have the disadvantage that conceivably they could mask a concurrent initial syphilis. Careful attention must be paid to the possibility of syphilis; otherwise, sulfadiazine should be used in the treatment of chancroid.

H. parainfluenzae, another member of the Hemophilus species, is an occasional cause of bacterial endocarditis.

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dence of elevated cerebrospinal fluid pressure, lumbar puncture should be performed with care, employing a small-gauge needle. Papilledema does not constitute a contraindication to lumbar puncture in patients in whom the diagnosis of meningitis is suspected. The cerebrospinal fluid pressure is usually elevated, and the gross appearance of the fluid may vary from slight turbidity to gross pus. The fluid should be centrifuged immediately, and the sediment stained by Gram's method and cultured on blood and chocolate agar under increased CO_2 tension and anaerobically in thioglycollate. Some common pitfalls encountered in Gram staining include washing the organisms off the slide, decolorizing gram-positive bacteria, and interpreting particles of stain as bacteria. Nevertheless, carefully performed Gram stains are accurate in 90 per cent of cases in which organisms are seen. Pneumococci are more easily identified than meningococci. Although immunofluorescent techniques have been used to expedite the diagnosis in a variety of bacterial meningitides, they appear to be no more accurate than a well-performed Gram stain. The cause of pneumococcal, meningococcal, and *H. influenzae* meningitis may be determined by counterimmunoelectrophoresis. However, this technique requires potent antisera for accurate results.

The number of cells in the cerebrospinal fluid is always elevated and varies between 100 and 100,000 per cubic millimeter. Initially, polymorphonuclear leukocytes predominate; these are replaced by lymphocytes as the inflammatory process progresses. Early in the infection one may find a plethora of bacteria with only a few cells. This is particularly true in pneumococcal and staphylococcal infections.

A low cerebrospinal fluid sugar is the hallmark of bacterial meningitis, and distinguishes it from the viral meningitides. Usually the value is below 40 mg per 100 ml and may be close to 0. Patients who have diabetes mellitus or who are receiving intravenous infusions of glucose may have falsely high glucose values. However, the ratio of blood to cerebrospinal fluid sugar in these patients is always higher than the normal value of 1.5 to 1. For example, a cerebrospinal fluid sugar of 150 mg per 100 ml in the presence of a blood sugar of 500 mg per 100 ml is highly significant. The information obtained from blood sugar, which should be obtained routinely at the time of initial lumbar puncture, is frequently critical.

The protein content of the cerebrospinal fluid is generally elevated and may be as high as 800 mg per 100 ml. Higher values are usually obtained in pneumococcal meningitis than in infections with other pathogens. The development of subarachnoid block is usually heralded by very high CSF protein values (800 to 1500 mg per 100 ml).

Other Cultures. Blood cultures should be obtained routinely in patients suspected of having meningitis; they are positive in approximately 50 per cent of cases. Occasionally, when the cerebrospinal fluid cultures are negative, the blood cultures may provide the only clue to the etiologic agent. Nose, throat, and ear cultures may not reflect the meningeal pathogen and are misleading too often to be of more than ancillary value in diagnosis.

Roentgenographic Studies. All patients with meningitis should have roentgenograms of the chest, skull, mastoid, and paranasal sinuses as soon as their condition permits. Frequently these provide the clue to the portal of entry of the pathogen. Eradication of these foci with antimicrobial therapy or surgical drainage may be essential for control of the meningeal infection. When a mass lesion is suspected, brain scan and arteriography should be performed.

Other Laboratory Tests. Most patients with meningitis are sufficiently ill to warrant determination of blood urea nitrogen and serum electrolytes, particularly because water intoxication and severe hyponatremia are not uncommon. Blood sugar should be determined routinely (best in conjunction with determination of the cerebrospinal fluid sugar). Lactic dehydrogenase and its isozymes are elevated in bacterial meningitis. Most of this increase is due to a rise in fractions representing leukocytes, but a rise in LDH isozyme fractions emanating from brain occurs only in patients who die or who are destined to develop neurologic sequelae.

Prognosis. Untreated meningitis is almost always fatal. Antimicrobial therapy has dramatically improved the outlook for patients with meningeal infections. However, except for recurrent pneumococcal meningitis in which the prognosis is remarkably good, the mortality in adequately treated pneumococcal meningitis remains between 10 and 70 per cent, and 50 per cent of infections with staphylococci and gram-negative enteric bacilli are lethal. On the other hand, the mortality rate associated with meningococcal and *H. influenzae* meningitis is less than 10 per cent. In addition to the difference in prognosis engendered by different microorganisms, factors that adversely influence outcome include (1) improper or delayed diagnosis, usually a consequence of falsely attributing confusion or delirium to "toxemic" depression of the central nervous system or hepatic encephalopathy; (2) fulminating infection with rapid loss of consciousness; (3) bacteremia; (4) old age or the neonatal period; (5) certain underlying and complicating illnesses, including bacterial endocarditis, brain abscess, diabetes mellitus, and pneumonia; and (6) development of coma, localizing neurologic signs, and convulsions.

Treatment. ***Choice of Therapy.*** Antimicrobials are the mainstay of therapy in bacterial meningitis and should be administered parenterally at the earliest possible moment. If the Gram stain of the cerebrospinal fluid reveals the causative microorganism, specific treatment may be instituted from the beginning. However, if microscopy of the stained smear has been inconclusive, the initial therapy must be sufficiently broad to be fully effective against the most reasonable possibilities. For example, purulent meningitis in an adult without evidence of an overt portal of entry is most apt to be pneumococcal or meningococcal; in a young child, *H. influenzae* must also be considered. Primary staphylococcal meningitis would be rare in a previously healthy adult, but should be considered in a long-hospitalized patient, particularly if neurosurgery has been performed.

Penicillin is the drug of choice for pneumococcal and meningococcal meningitis, and should be administered parenterally in a dosage of 10 to 20 million units a day. For patients who are sensitive to penicillin, chloramphenicol in dosage of 4.0 to 6.0 grams per day should be used. The cephalosporins enter even the inflamed meninges poorly and should not be used for the treatment of meningitis.

There is still considerable debate whether *H. influenzae* meningitis should be treated with chloramphenicol (4.0 to 6.0 grams a day) or ampicillin (6.0 to 12.0 grams a day). Both drugs are probably equally effective, but ampicillin has the additional advantage of being bactericidal for pneumococci and meningococci. Use of this agent

UNITED STATES COURT OF APPEALS
SECOND CIRCUIT

JOSEPH ANTHONY CAMIRE, Infant by his Father, JAMES ANTHONY CAMIRE, and his Mother, GAIL MARIE CAMIRE, and JAMES ANTHONY CAMIRE and GAIL MARIE CAMIRE, Individually,

Plaintiffs-Appellants,

-against-

UNITED STATES OF AMERICA,

Defendant-Respondent.

Docket No.
76 CIV 6038

STATE OF NEW YORK)
) ss.:
COUNTY OF ESSEX)

EVELYN A. HATCH, being duly sworn, deposes and says, that deponent is not a party to the action, is over 18 years of age and resides at Willsboro, New York.

That on the 16th day of March, 1976, deponent served the within brief and record on appeal in this action upon Asst. U.S. Attorney Richard Hughes, attorney for respondent, at P.O. Building, Albany, New York, the address designated by said attorney for that purpose by depositing a true copy of same enclosed in a postpaid properly addressed wrapper, in a post office under the exclusive care and custody of the United States post office department within the State of New York.

Evelyn A. Hatch

Sworn to beforeme this
16th day of March, 1976
Florence E Hathaway
Notary Public

FLORENCE E. HATHAWAY
Notary Public in the State of New York
No. 16-6804117
Qualified in Essex County
My Commission Expires March 30, 19 78